WHAT IS CLAIMED IS:

1. An electro-optically active gel layer having nematic, ferroelectric, antiferroelectric or electroclinic properties comprising a quantity of aligned liquid crystal molecules having an anisotropic three-dimensional polymer network homogeneously dispersed therein, wherein the polymer network comprises a plurality of sparsley cross-linked polymer molecules.

2. An electro-optically active gel layer as described in claim 1, wherein the polymer network dictates the alignment of the molecules.

3. An electro-optically active gel layer as described in claim 1, wherein the polymer comprises less than 5% of the gel layer by mass.

4. An electro-optically active gel layer as described in claim 1, wherein the polymer comprises equal to or less than 2% of the gel layer by mass.

5. An electro-optically active gel layer as described in claim 1, wherein the polymer has a molecular weight of at least 1 million g/mol.

6. An electro-optically active gel layer as described in claim 1, wherein the polymer is a fluorinated polymer.

7. An electro-optically active gel layer as described in claim 1, wherein the electro-optically active material has a switching time less than double the switching time of the liquid crystal molecules in the absence of the polymer.

8. An electro-optically active gel layer as described in claim 1, wherein the polymer is either a block copolymer or telechelic polymer.

9. An electro-optically active gel layer as described in claim 1, wherein the polymer molecules are cross-linked only at the ends.

10. An electro-optically active gel layer as described in claim 1, wherein the homogeneously dispersed polymer network of liquid crystal molecules comprises a plurality of self-assembly block copolymers each comprising at least one endblock and at least one midblock, wherein the endblock either physically or chemically cross-links with at least one other endblock and wherein the midblock is soluble in the liquid crystal molecules.

11. An electro-optically active gel layer as described in claim 10, wherein the endblock is insoluble in the liquid crystal molecules.

12. An electro-optically active gel layer as described in claim 10, wherein the midblock further comprises a plurality of liquid crystal side-chains, wherein the liquid crystal side-chains confer solubility to the block copolymer in the liquid crystal molecules.

13. An electro-optically active gel layer as described in claim 10, wherein the midblock is a main-chain liquid crystal polymer comprising a plurality of liquid crystal mesogens, and wherein the main-chain confers solubility to the midblock of the polymer in the liquid crystal molecules.

14. An electro-optically active gel layer as described in claim 10, wherein the midblock comprises a mixed side-chain/main-chain liquid crystal polymer, and wherein at least one of the main-chain or the side-chain structures confers solubility to the midblock of polymer in the liquid crystal molecules.

15. An electro-optically active gel layer as described in claim 10, wherein the endblock further comprises at least one linking block, wherein the linking block either physically or chemically cross-links with either the linking block or endblock of another polymer.

16. An electro-optically active gel layer as described in claim 10, wherein the endblock is made crosslinkable with other endblocks by application of either a photo or thermal initiating energy.

17. An electro-optically active gel layer as described in claim 16, wherein the photo initiating energy is selected from the group consisting of: UV-light, X-ray, gamma-ray, and radiation with high-energy electrons or ions.

18. An electro-optically active gel layer as described in claim 1, wherein the network of liquid crystal molecules comprises a plurality of self-assembly telechelic polymers each comprising at least one crosslinking functional group, wherein the crosslinking functional group either physically or chemically cross-links with at least one other crosslinking functional group and wherein the telechelic polymer is soluble in the liquid crystal molecules.

19. An electro-optically active gel layer as described in claim 18, wherein the crosslinking functional group is insoluble in the liquid crystal molecules.

20. An electro-optically active gel layer as described in claim 18, wherein the telechelic polymer further comprises a plurality of liquid crystal side-chains, wherein the liquid crystal side-chains confer solubility to the telechelic polymer in the liquid crystal molecules.

21. An electro-optically active gel layer as described in claim 18, wherein the telechelic polymer is a main-chain polymer comprising a plurality of liquid crystal mesogens, and wherein the main-chain confers solubility to the telechelic polymer in the liquid crystal molecules.

22. An electro-optically active gel layer as described in claim 18, wherein the telechelic polymer comprises a mixed side-chain/main-chain polymer, and wherein at least one of the main-chain or the side-chain confers solubility to the telechelic polymer in the liquid crystal molecules.

23. An electro-optically active gel layer as described in claim 18, wherein the telechelic polymer further comprises at least two crosslinking groups at either end of the telechelic polymer.

24. An electro-optically active gel layer as described in claim 18, wherein the crosslinking group is made crosslinkable with other crosslinking groups by application of either a photo or thermal initiating energy.

25. An electro-optically active gel layer as described in claim 24, wherein the photo initiating energy is selected from the group consisting of: UV-light, X-ray, gamma-ray, and radiation with high-energy electrons or ions.

26. An electro-optically active gel layer as described in claim 1 wherein the liquid crystal molecules are aligned according to a geometry selected from the group consisting of: uniaxial, twisted, supertwisted, tilted, chevron and bookshelf.

27. An electro-optically active gel layer having nematic, ferroelectric, antiferroelectric or electroclinic properties comprising a quantity of liquid crystal molecules having an anisotropic three-dimensional polymer network homogeneously dispersed therein, wherein the polymer network comprises a plurality of sparsely cross-linked polymer molecules, wherein the liquid crystal molecules comprises less than 5% of the gel layer by mass.

28. An electro-optically active gel layer as described in claim 27, wherein the polymer network further dictates the alignment of the liquid crystal molecules.

29. A method of manufacturing an electro-optically active gel layer comprising:

providing a quantity of liquid crystal molecules;

providing a quantity of polymer;

homogeneously dispersing the quantity of polymer into the quantity of liquid crystal molecules;

orienting the liquid crystal molecules and polymers; and

sparsely crosslinking the polymers to form an anisotropic polymer network.

30. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the anisotropic polymer network is also adapted to dictate the alignment of the liquid crystal molecules.

31. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer is either a block copolymer or a telechelic polymer.

32. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer is made using a technique selected from the group consisting of: anionic, radical and polymer analogous.

33. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the liquid crystal molecules are oriented by a method selected from the group consisting of: surface alignment, energetic field alignment, shear stress alignment, and extensional stress alignment.

34. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymers are aligned according to a geometry selected from the group consisting of: uniaxial, twisted, supertwisted, tilted, chevron and bookshelf.

35. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer comprises less than 5% of the gel by mass.

36. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer comprises equal to or less than 2% of the gel by mass.

37. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer is either chemically or physically crosslinked.

38. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer is crosslinked by self-assembly.

39. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer is crosslinked by thermal or photo initiation.

40. A method of manufacturing an electro-optically active gel layer as described in claim 39, wherein the photo initiation uses an energy selected from the group consisting of: UV-light, X-ray, gamma-ray, and radiation with high-energy electrons or ions.

41. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer is crosslinked by a combination of self-assembly and thermal or photo initiation.

42. A method of manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer has a molecular weight of at least 1 million g/mol.

43. An electrooptic device comprising two substrates, which are provided with at least one electrode, and an electro-optically active gel layer which is located between the two substrates, wherein the electro-optically active gel layer has nematic, ferroelectric, antiferroelectric or electroclinic properties and comprises a quantity of aligned liquid crystal molecules having an anisotropic three-dimensional polymer network homogeneously dispersed therein, wherein the polymer network comprises a plurality of sparsely cross-linked polymer molecules.

44. An electrooptic device as described in claim 43, wherein the polymer network further dictates the alignment of the liquid crystal molecules.

45. An electrooptic device as described in claim 43, in the form of a display device.

46. An electrooptic device comprising two substrates, which are provided with at least one electrode, and an electro-optically active gel layer which is located between the two substrates, wherein the electro-optically active gel layer has

nematic, ferroelectric, antiferroelectric or electroclinic properties and comprises a quantity of aligned liquid crystal molecules having an anisotropic three-dimensional polymer network homogeneously dispersed therein, wherein the polymer network comprises a plurality of sparsely cross-linked polymer molecules, wherein the liquid crystal molecules comprises less than 5% of the gel layer by mass, and wherein the polymer network mechanically stabilizes the liquid crystal molecules.

47. An electrooptic device as described in claim 46, wherein the polymer network further dictates the alignment of the chiral liquid crystal molecules.

48. An electrooptic device as described in claim 46, in the form of a display device.

49. An electro-optically active gel layer as described in claim 1, wherein the polymer network mechanically stabilizes the liquid crystal molecules.

50. An electro-optically active gel layer as described in claim 27, wherein the polymer network mechanically stabilizes the liquid crystal molecules.

51. A method for manufacturing an electro-optically active gel layer as described in claim 29, wherein the polymer network mechanically stabilizes the liquid crystal molecules.

52. An electro-optic device as described in claim 43, wherein the polymer network mechanically stabilizes the liquid crystal molecules.

53. An electro-optically active gel layer as described in claim 1, wherein the polymer has a molecular weight of at least 100,000 g/mol.

54. An electro-optically active gel layer as described in claim 29, wherein the polymer has a molecular weight of at least 100,000 g/mol.

55. An electro-optically active gel layer as described in claim 43, wherein the polymer has a molecular weight of at least 100,000 g/mol.